> ducitur, *Hypothesis* vocanda est; et Hypotheses, seu Metaphysicæ, seu Physicæ, seu Qualitatum occultarum seu Mechanicæ, in *Philosophia Experimentali* locum non habent."
>
> "Adjicere jam liceret nonnulla de Spiritu quodam subtilissimo corpora crassa pervadente, et in iisdem latente, cujus vi et actionibus particulæ corporum ad minimas distantias se mutuo attrahunt, et contiguæ factæ cohærent." "Sed hæc paucis exponi non possunt; neque adest sufficiens copia Experimentorum, quibus leges actionum hujus Spiritus accurate determinari et monstrari debent."

Now the present work of "Waterdale" is all Hypothesis from beginning to end; and there is no careful detailed experiment to be found described in the book, by which the various Hypotheses brought forward by him can be tested.

At a first glance the theory seems a revival of the Cartesian Theory of Vortices, advanced in Newton's day by Descartes to account for the motion of the celestial bodies, and the difficulties attending this Theory are pointed out by Newton in his "Scholium Generale"—

> "Hypothesis Vorticum multis premitur difficultatibus. Ut Planeta unusquisque radio ad Solem ducto areas describat tempori proportionales, tempora periodica partium Vorticis deberent esse in duplicata ratione distantiarum a Sole," &c.

This ancient theory is attributed by our author to F. Major, in his recent work, "Spacial and Atomic Energy," Parts I. and II.; but the author himself gives, as the primary reason for gravity, the *mutual shelter* to opposite wave-energy afforded by two spheres or bodies; and now, if "Waterdale" is anxious to convert the scientific world, he must utilize the quantitative theoretical results, worked out by Lord Rayleigh, on the Apparent Attraction due to Vibration.

The book abounds with curious unfamiliar dynamical expressions, such as *real*, *vested*, *imposed*, and *specific ponderosity*, *force of diversion*, *rectangular velocity*, *concentering preponderating energy*, *film of transplacement*, &c., of which no definitions are given; and altogether the treatment is unconventional in the extreme.

"Waterdale" concludes by asking that the question of *mechanical perpetual motion* should be reopened, and that pure mathematics should be once more applied to the subject—

> "*Perpetual motion* has already been granted to us. By the burning of coal and evaporation of water we have work performed for us by Nature. Perpetuate the process, and the work is also perpetuated. We have many ways of acquiring this gift from Nature's stores, and one more possible method need not startle the human mind."

This method of *quasi*-scientific argument is familiar to us, in the newspapers, in the account and explanation of Spiritualistic Phenomena. A. G. G.

OUR BOOK SHELF.

Indischer Ozean: ein Atlas die Physikalischen Verhältnisse, und die Verkehrs-Strassen darstellend. (Hamburg: Deutsche Seewarte, 1891.)

THESE maps of meteorological and other physical data for the Indian Ocean, while giving a very fair idea of the prevailing conditions, are scarcely equal to the scientific requirements of the present year of grace.

While it may be freely confessed that our knowledge of the area dealt with is yet very imperfect, and that the scale of this handy atlas does not permit of great refinements, there are many details to which exception may fairly be taken. A few instances may be given.

In the map of general depth no indication is furnished of the extreme sparseness of the soundings from which the various coloured areas are drawn.

The current charts are depicted with a hardness and regularity with regard to the different streams that are scarcely consistent with nature. The ever-varying circumstances of the monsoons render the currents of this ocean especially changeable, and it would be preferable to indicate this characteristic by lines more broken. In the sheet of the north-east monsoon period, the meeting of the two main currents on the East African coast never takes place so far south as is shown, nor is there any justification for the peculiar direction of the line between them to the eastward.

It is a bold thing to attempt to portion the sea into areas of definite surface specific gravities. The data are very scanty.

The pressure charts, which are given for the same months as those published by the Meteorological Office, and the map showing the relative prevalence of winds, are good; but here again the absence of the data on which the various quantities in different areas are founded is a serious flaw.

The different maps are well got up, and bear further witness to the general excellence of German lithography.

Mechanics for Beginners. Part I. Dynamics and Statics, By the Rev. J. B. Lock. (London: Macmillan and Co., 1891.)

MR. LOCK states that the work before us contains the more elementary parts of the dynamics of a particle and of the statics of parallel forces, arranged with some additions from his "Elementary Dynamics and Statics." The author's mode of treatment will be familiar to many of our readers, and we need hardly say that Mr. Lock slurs over no difficulty that presents itself to the young student of this difficult subject. We have read the whole of the text with much interest, and pronounce it to be excellent. A boy who has gone through this, and worked out the examples in the manner shown him by the author, will be well equipped for more advanced treatises. A novelty, to which Mr. Lock draws attention, is a new form of "that proof of the formula of accelerated motion which depends upon the idea of average velocity." This proof appears to be a satisfactory one. There is an interesting combination of Morin's and Atwood's machines, which is likely to furnish a useful illustration to students. The work is split up into eight sections—rectilinear motion, motion in one plane, forces acting at a point, parallel forces, machines, uniform motion in a circle, energy, and the pendulum. The arrangement has been made to meet the special wants of the Science and Art Department. It is suited for any junior students. Article 16 appears to us to be likely to be too difficult for a boy; if so, he can pass on, and return to it subsequently. We have not worked out the examples which accompany the several chapters, and to which answers are given at the end. The following errors we have noted: p. 17, l. 8 up, dele a in anT; p. 19, l. 5 up, the first 2 N's should be N′; p. 20, last line, for 252 read 162; p. 52, l. 1, it would seem to follow that "when one mass meets another mass of the *same* velocity" they would not be said to *impinge*. What would they be said to do? P. 67, the term *resolute* is defined, reference might be made to p. 92; p. 68, l. 1, dele a; p. 72, l. 8 up, for Q read H; p. 94, l. 7, for an $=$ read $+$; p. 115, l. 7 up, read $10-x$; p. 139, l. 2, for 4 read 3; p. 205, last line, numerator, for $\cos a$ read $\sin a$; p. 208, l. 20, supply g; p. 246, l. 8 up, for second g read g_1. The greater number of these errors are trifling, and will not give the private student much trouble; we have pointed

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them out because we know what a stumbling-block even slight mistakes are to such students. Their reverence for printed results is often wonderful. The utility of Mr. Lock's "Higher Trigonometry" is greatly hindered by the number of typographical blunders.

The Physical Geology and Geography of Ireland. By Edward Hull, F.R.S. Second Edition. (London: Edward Stanford, 1891.)

THE first edition of this book was reviewed in NATURE rather more than thirteen years ago (vol. xviii. p. 354). Of the second edition, which will be welcomed by all students of the subjects it deals with, we need only say that Prof. Hull has embodied in it the additions which have lately been made to our knowledge of the geological structure of Ireland. The more important of these additions he sums up under the following heads:—(1) The determination of the occurrence of Archæan rocks in certain districts of the west and north of Ireland. (2) The determination of the peculiar relations subsisting between the Lower Devonian (or Devono-Silurian) strata and the Upper Old Red Sandstone and Carboniferous series of the southern districts. (3) Additional evidence regarding the relative ages of the trachytic and basaltic lavas of Antrim. (4) Evidence of the invasion of Ulster by a great ice-sheet from the Grampian Mountains of Scotland during the earliest stage of the Glacial period.

The Ouse. By A. J. Foster, M.A. (London: Society for Promoting Christian Knowledge, 1891.)

IN this little book the course of the Ouse is traced from its source to the point where it enters the sea, and some account is given of the various elements of interest that are to be met with on the way. The idea is good, and the author has worked it out skilfully. Any boys or girls who may read the volume will find at the close that they have obtained from it much sound geographical knowledge.

LETTERS TO THE EDITOR.

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A Difficulty in Weismannism.

IN your number of October 29 (vol. xliv. p. 613), Prof. Hartog depicts a dilemma in which a study of Weismann's theories has placed him.

Prof. Hartog sums up the main points of Weismann's theories in five theses, but, considering the great importance which the latter attaches to the operation of *natural selection*, he might well have added a *sixth* to the list.

There can be no doubt that, of the two hypotheses brought forward in the letter, hypothesis B is the one adopted by Weismann for the explanation of the problems of heredity. We are therefore not concerned with hypothesis A.

"According to hypothesis B," Prof. Hartog states, "the Ahnenplasmas of all Metazoa being similar and Protozoan, if the *numbers are equal* and the shuffling fair, any two parents may beget any offspring whatever; . . . a lioness might be expected to bring forth a lobster or a starfish, &c."

What does Prof. Hartog mean by *fair shuffling?* Surely not such shuffling as is resorted to in the game of whist, but such shuffling as he himself describes in thesis 4. He states here that the "process is comparable to the shuffling of two packs of cards by taking half from each and joining the talons or remainders to form a new pack."

It surely cannot be imagined that Weismann ever intended to assert that with each sexual act there was a rearrangement of the Ahnenplasmas comparable to the shuffling of a pack of cards during the game of whist.

Did he anywhere asert this, we should naturally expect him to believe that a lioness might as well bring forth human beings or lobsters as normal cubs.

With the evolution of sexuality, the excessively numerous Ahnenplasmas of our variable Protozoan ancestors became *arranged* in more and more complex, ever-varying *combinations.* At the very outset, natural selection operated. The variations (due to the combinations) most advantageous to the species were perpetuated. Unfavourable variations involved extinction. It is the *special combination* of the units of ancestral germ-plasm which predetermines the structure of the mature individual. This combination, of course, is very closely related to the two combinations from which it arose, and it is just this closeness of relationship which prevents us from supposing that a lioness can ever produce anything but cubs. Changes in the combinations are only slowly effected. The influence of the mother is due to the fact that one-half of the maternal combination is present in the offspring, and similar statements can of course be made concerning the influences of father, grandfather, great-grandfather, &c.

Do not these two considerations—(1) that the nature of the individual depends upon the *peculiar combination* of units of ancestral Protozoan germ-plasm, a combination very closely related to two previous ones (owing to the fact that, in sexual union, two halves of immediately preceding combinations are united to make one whole); (2) that the operation of natural selection provides for the *extinction* of *useless*, and the *preservation* of *useful* variations—afford to Prof. Hartog the means of escaping from his dilemma? A. H. TROW.

Penarth, Cardiff, November 14.

THE contributions of Mr. Trow and Dr. Poulton to this discussion render necessary an explanation that should, perhaps, have accompanied my first letter. After rough-drafting this, I felt misgivings lest I might have misconceived Weismann's meaning, and set up a man of straw to knock down. Accordingly, I wrote to Prof. Weismann to ask if I rightly understood his meaning, explaining my object in doing so; and he answered my queries with great kindness, courtesy, and fulness. As I wrote back to him, I then thought it better, relieved from my misgivings, to state the point without reference to his letter. But Mr. Trow and Dr. Poulton have both blamed my use of the word shuffling, and appear to think that my hypothesis A is a purely imaginary conception of the straw man order. I hope, therefore, I shall not be accused of having wilfully kept a trump card up my sleeve if I now quote the two essential passages of Prof. Weismann's letter, which were written in definition of the points at issue.

"Ich denke mir dass das Keimplasma eines Individuum's aus einer gewissen Zahl von Einheiten besteht, welche untereinander sehr ähnlich, aber nicht gleich sind. Die Unterschiede zwischen ihnen entsprechen meist den Unterschieden zwischen je zwei Individuen derselben Species. *Jedes derselben würde im Stande sein ein Individuum der Art hervorzubringen falls es sich zu der dazu nöthigen Masse vervielfältigen könnte oder würde.*" The sentence I have italicized corresponds, I think, very fairly to my hypothesis A: "Each Ahnenplasma unit corresponds to an individual of the species itself; and if put under suitable trophic conditions would, singly, reproduce such an individual." Dr. Poulton writes: "I agree with Prof. Hartog in considering it [Hypothesis A] as valueless." I am far from considering any hypothesis as valueless which upsets a wrong theory of which it should be the mainstay.

Prof. Weismann goes on: "Sie können ganz wohl die geschlechtliche Fortpflanzung mit dem Mischen eines Kartenspiels vergleichen, aus dem immer die Hälfte der Karten entfernt wird. Nur ist nicht zu vergessen dass die Karten selbst nicht völlig unveränderlich sind." It is obvious that Prof. Weismann accepts the peculiar mode of shuffling I have described (not the ordinary mode at whist), as a fair illustration of his conception of fertilization and its antecedents. He always speaks of *combinations* in his "Essays," and not *permutations.* The reason is obvious: the figured elements of the living nucleus are constantly changing their relative position; and it is these that are the outward and visible sign of the mysterious ancestral units.

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